

UNITED STATES PATENT APPLICATION

OF

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FOR

DISHWASHER

[0001] This application claims the benefit of Korean Application(s) No. 10-2002-0075063 filed on November 28, 2002 which is/are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to a dishwasher.

Discussion of the Related Art

[0003] Generally, a dishwasher is an apparatus for automatically washing and drying tableware by injecting water and detergent on the tableware. A dishwasher according to a related art is explained by referring to the attached drawings.

[0004] FIG. 1 is a cross-sectional view of a dishwasher according to a related art.

[0005] Referring to FIG. 1, a dishwasher according to a related art mainly consists of a cabinet 2 having a large open front side, a washing chamber 4 provided in the cabinet 2, and a door 6 opening closing the open front side of the cabinet 2.

[0006] Upper and lower racks 8 and 9 on which tableware is put are provided in the washing chamber 4, and top and bottom nozzles 12 and 14 injecting water via injection holes 10 are rotatably provided under the upper and lower racks 8 and 9, respectively.

[0007] A sump 16 is provided under the washing chamber 4 to collect water therein. A pump 24 connected to a supply pipe 22 is provided at one side of the sump 16 to pump water to the top and bottom nozzles 12 and 14. And, a heater assembly (not shown in the drawing) for heating water held in the sump 16 is provided in the sump 16.

[0008] The supply pipe 22 is connected to upper and lower pipes 26 and 28 guiding water to the top and bottom nozzles 12 and 14, respectively. Hence, when the pump 24 operates, the water in the sump 16 is supplied to the top and bottom nozzles 12 and 14 via the

supply pipe 22 and the upper and lower pipes 26 and 28. Inlet valve and pipe for supplying water to the sump 16 and drain pump assembly and pipe for draining the water in the sump are installed at one side of the sump 16.

[0009] And, a filter 18 is installed over the sump 16 to filter the water flowing in the sump 16 from the washing chamber 4 to remove particles from the water.

[0010] Meanwhile, a valve assembly 30 for electrically opening/closing the upper and lower pipes 26 and 28 is installed at a portion where the upper and lower pipes 26 and 28 are connected to the supply pipe 22 to selectively allow the water flow in.

[0011] FIG. 2 is a cross-sectional view of a valve assembly of a dishwasher according to a related art.

[0012] Referring to FIG. 2, the valve assembly 30 consists of protrusions 32a and 32b formed inside the upper and lower pipes 26 and 28, respectively, a pair of check valves 34a and 34b, and a pair of solenoid valves 36a and 36b.

[0013] The check valves 34a and 34b are movably installed in the upper and lower pipes 26 and 28 to open/close the upper and lower pipes 26 and 28, respectively. And, the solenoid valves 36a and 36b are installed under the check valves 34a and 34b to turn on/off the check valves 34a and 34b by magnetic forces, respectively.

[0014] Of course, the check valves 34a and 34b are magnetic bodies movable by the magnetic forces on operating the solenoid valves 36a and 36b, respectively.

[0015] An operation of the related art dishwasher is explained in short as follows.

[0016] First of all, once the pump 24 is driven, the check valves 34a and 34b are moved upward by the water flowing in via the supply pipe 22 to be brought contact with the protrusions 32a and 32b, respectively. Hence, the check valves 34a and 34b blocks the upper and lower pipes 26 and 28 to prevent the water from flowing in the upper and lower pipes 26

and 28, respectively.

[0017] Thereafter, once a pair of the solenoid valves 6a and 36b are driven, the check valves 34a and 34b move downward by the magnetic forces to open the upper and lower pipes 26 and 28, respectively. Hence, the water is supplied to the top and bottom nozzles 12 and 14 via the upper and lower pipes 26 and 28, respectively.

[0018] Yet, when both of the upper and lower pipes 26 and 28 are open by driving a pair of the solenoid valves 36a and 36 b simultaneously, the water is supplied to the top and bottom nozzles 12 and 14 along the upper and lower pipes 26 and 28, respectively so that the water pressures and injection powers thereof are lowered. Hence, the solenoid valves 36a and 36b are selectively operated to supply the water via either the upper or lower pipe 26 or 28.

[0019] However, in the related art dishwasher, the magnetic check valves are provided in the upper and lower pipes and the check valves are turned on/off by the expensive solenoid valves, respectively, whereby product costs are increased.

[0020] Moreover, since the solenoid valves are electrically driven, electric safety accident may take place as well as power consumption thereof increases.

SUMMARY OF THE INVENTION

[0021] Accordingly, the present invention is directed to a dishwasher that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0022] An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a dishwasher, in which upper and lower pipes are opened/closed using a water pressure to simplify a configuration of the dishwasher and to reduce product costs thereof.

[0023] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent to those having ordinary skill in the art upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject matter particularly pointed out in the specification and claims hereof as well as in the appended drawings.

[0024] To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, there is provided a dishwasher including a washing chamber, top and bottom nozzles injecting water in the washing chamber, a sump provided under the washing chamber to store the water, a pump pumping the water stored in the sump, a supply pipe adjacent to one side of the pump wherein the water pumped by the pump flows in the supply pipe, upper and lower pipes leading the water to the top and bottom nozzles, respectively, and a valve assembly connecting the supply pipe to the upper and lower pipes to selectively open/close the upper or lower pipe using a pressure of the pumped water.

[0025] The driving valve assembly includes a guide having an inlet hole connected to the supply pipe at top, the guide having first and second holes connected to the upper and lower pipes, respectively formed at a bottom, the guide having an inner passage circulating inside and a ball moving along the inner passage to selectively open/close the first or second outlet hole.

[0026] And, a diameter of the ball is greater than that of each of the inlet hole and the first and second outlet holes. The guide includes a first guide having the inlet hole and a second guide having the first and second holes.

[0027] Moreover, a rib protrudes upward from a circumference of the first guide and

a groove is formed in a circumference of the second guide to be coupled to the rib. Preferably, a diameter of the ball is greater than that of each of the inlet hole and the first and second outlet holes.

[0028] Meanwhile, the inner passage is so slant that the ball can move in one direction. Specifically, the inner passage includes a first passage slant upward from the inlet hole toward the first outlet hole, a second passage slant upward from the first outlet hole toward the second outlet hole, and a third passage slant downward from the second outlet hole toward the inlet hole.

[0029] And, a first step is formed on an upper inside of the guide to prevent the ball lying at the inlet hole from moving toward the third passage by the pressure of the water.

[0030] Moreover, a second step is formed on a lower inside of the guide to prevent the ball lying at a lower side of the first outlet hole from moving along the first passage. And, a third step is formed on a lower inside of the guide to prevent the ball lying at a lower side of the second outlet hole from moving along the second passage.

[0031] Meanwhile, a protrusion is formed between the first and second outlet holes to prevent the ball blocking the first outlet hole from moving to the second outlet hole along the second passage.

[0032] It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application,

illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0034] FIG. 1 is a cross-sectional view of a dishwasher according to a related art;

[0035] FIG. 2 is a cross-sectional view of a valve assembly of a dishwasher according to a related art;

[0036] FIG. 3 is a cross-sectional partial view of a dishwasher according to the present invention;

[0037] FIG. 4 is a perspective view of a valve assembly according to the present invention; and

[0038] FIG. 5 is a perspective view of a disassembled guide according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0039] Reference will now be made in detail to the preferred embodiment(s) of the present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

[0040] FIG. 3 is a cross-sectional partial view of a dishwasher according to the present invention.

[0041] Referring to FIG. 3, a dishwasher according to the present invention includes a cabinet 52 having a large open front side, a washing chamber 54 provided in the cabinet 52, and a door 56 opening closing the open front side of the cabinet 52.

[0042] Upper and lower racks 58 and 59 on which tableware is put are provided in the washing chamber 54 to slide in and out, and top and bottom nozzles 62 and 64 injecting

water via injection holes (not shown in the drawing) are rotatably provided under the upper and lower racks 58 and 59, respectively.

[0043] A sump 66 is provided under the washing chamber 54 to collect water therein. A pump 74 pumping water and a supply pipe 72 in which the water pumped by the pump 74 flows are provided at one side of the sump 66.

[0044] Although not shown in the drawing, a heater assembly for heating water held in the sump 66 is provided in the sump 16. Inlet valve and pipe for supplying water to the sump 66 and drain pump assembly and pipe for draining the water in the sump are installed at one side of the sump 66.

[0045] And, a filter 68 is installed over the sump 66 to filter the water flowing in the sump 66 from the washing chamber 54 to remove particles from the water.

[0046] Meanwhile, a valve assembly 80 for connecting the supply pipe 72 to the upper and lower pipes 76 and 78 is installed between the supply pipe 72 and the upper and lower pipes 76 and 78. And, the valve assembly 80 selectively opens/closes the upper and lower pipes 76 and 78 using a pressure of the water pumped by the pump 74.

[0047] FIG. 4 is a perspective view of a valve assembly according to the present invention and FIG. 5 is a perspective view of a disassembled guide according to the present invention.

[0048] Referring to FIG. 4 and FIG. 5, the valve assembly 80 includes a guide 85 connecting the supply pipe 72 to the upper and lower pipes 76 and 78 and a ball 87 (cf. FIG. 3) provided in the guide 85.

[0049] An inlet hole 82a connected to the supply pipe 72 is formed at a bottom of the guide 85, first and second outlet holes 84a and 84b connected to the upper and lower pipes 76 and 78, respectively are formed at a top of the guide 85, and an inner passage is formed inside

the guide 85 to circulate.

[0050] And, the ball 87 moves along the inner passage inside the guide 85 to selectively open/close the first and second outlet holes 84a and 84b.

[0051] In this case, a diameter of the ball 87 is smaller than that of the inner passage to move along inside the guide 85, but is greater than that of each of the inlet hole 82a and the first and second outlet holes 84a and 84b since the ball 87 has to block the inlet hole 82a and the first and second outlet holes 84a and 84b selectively.

[0052] The ball 87 is normally formed spherical, but may be fabricated oval.

[0053] Meanwhile, the guide 85 may includes a first guide 82 having the inlet hole 82 and a second guide 84 having the first and second outlet holes 84a and 84b.

[0054] In this case, a rib 82b is formed to protrude from a circumference of the first guide 82, and a groove 84c is formed at a circumference of the second guide 84 to be coupled to the rib 82b. Hence, the first and second guides 82 and 84 are coupled to each other by the rib 82b and groove 84c.

[0055] And, a plurality of coupling portions 84h are formed on the circumference of the second guide 84. The coupling portions 84h are coupled to a plurality of coupling bosses 66a formed at the sump 66, respectively to fix the guide 85 to a topside of the sump 66.

[0056] Specifically, screw holes are formed at the coupling portions 84h and the coupling bosses 66a, respectively, and the coupling portions 84h are coupled to the coupling bosses 66a by screws, respectively.

[0057] Meanwhile, the inner passage is formed slant to enable the ball 87 to move in one direction. Namely, the inner passage includes a first passage 92 slant upward from the inlet hole 82a toward the first outlet hole 84a, a second passage 94 slant upward from the first outlet hole 84a toward the second outlet hole 84b, and a third passage 96 slant downward

from the second outlet hole 84b toward the inlet hole 82a.

[0058] And, a first step 91 is formed on an upper inside of the guide 85 to prevent the ball 87 lying at the inlet hole 82a from moving toward the third passage 92 by a pressure of the water.

5 [0059] Moreover, a second step 93 preventing the ball 87 lying at a lower side of the first outlet hole 84a from moving to the inlet hole 84a along the first passage 92 and a third step preventing the ball lying at a lower side of the second outlet hole 84b from moving along the second passage 94 to the first outlet hole 84a are formed on a lower inside of the guide 85.

10 [0060] Besides, a protrusion 97 is formed between the first and second outlet holes 84a and 84b to prevent the ball 87 blocking the first outlet hole 84a from moving to the second outlet hole 84b along the second passage 94 by the pressure of the water.

[0061] Functions of the first to third steps 91, 93, and 95 and the protrusion 97 will be explained in explaining an operation of the dishwasher as follows.

15 [0062] An operation of the above-constructed dishwasher according to the present invention is explained as follows.

[0063] First of all, once power is applied to the dishwasher to operate, the inlet valve (not shown in the drawing) is turned on to have the water flow in the sump 66. The water flowing in the sump 66 is then pumped by the pump 74.

20 [0064] The water pumped by the pump 74 flows in the guide along the supply pipe 72. In this case, the ball 87 lying at the inlet hole 82a ascends by the pressure of the water to move to block the first outlet hole 84a along the first passage 92.

[0065] In doing so, the ball 87 may move toward the third passage 96 by the pressure of the water. Yet, the ball 87 is interrupted by the first step 91 on the upper inside of the guide 85 not to move along the third passage 96 but to move to block the first outlet hole 84a along

the first passage 92.

[0066] Moreover, in blocking the first outlet hole 84a, the ball 87 is held by the protrusion 97 between the first and second outlet holes 84a and 84b to prevent from moving. Namely, receiving the water pressure, the ball 87 intends to move toward the second outlet
5 hole 84b along the first and second passages 92 and 94 slant upward. Yet, the ball 87 is prevented from moving to the second outlet hole 84b by the protrusion 97.

[0067] Hence, the water is not supplied to the upper pipe 76 but is injected into the washing chamber 54 via the second outlet hole 84b, lower pipe 78, and bottom nozzle 64, in turn.

10 [0068] Thereafter, if the pump 74 stops operating, the pressure of the water is lowered so that the ball 87 descends in the first outlet hole 84a. The descending ball 87 is then held by the second step 93 to lie at the lower side of the first hole 84a. Namely, after descending in the first outlet hole 84a, the ball 87 intends to return to the inlet hole 82a along the slant first passage 92. In this case, the ball 87 is held by the second step 93 not to roll down along the
15 first passage but to stop.

[0069] And, once the pump 74 operates again, the ball 87 moves to the second outlet hole 84b along the second passage 94 by the pressure of the water and then blocks the second outlet hole 84b.

[0070] Hence, the water is not supplied to the lower pipe 78 but is injected into the
20 washing chamber 54 via the open first outlet hole 84a, upper pipe 76, and top nozzle 62, in turn.

[0071] If the pump 74 stops operating again, the ball 87 descends in the second outlet hole 84b as the pressure of the water is lowered. The ball 87 then moves along the third passage 96 to return to the inlet hole 82a.

[0072] In doing so, the ball 87 may move along the second passage 94 but is prevented by the third step 95 from moving along the second passage 92.

[0073] Thus, the ball 87 moves along the inner passage inside the guide 85 according to the operation of the pump 74 to selectively block the first or second hole 84a or 84b, and the water is injected into the washing chamber 54 via the selectively opened upper or lower pipe 76 or 78.

[0074] Accordingly, the dishwasher according to the present invention has the following advantages or effects.

[0075] First of all, the ball provided inside the guide moves by the water pressure to open/close the upper or lower pipe, whereby the configuration is simplified as well as the product costs are reduced.

[0076] Secondly, the present invention does not adopt the electric device as the valve assembly, thereby enabling to prevent accidents to enhance product reliance.

[0077] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.